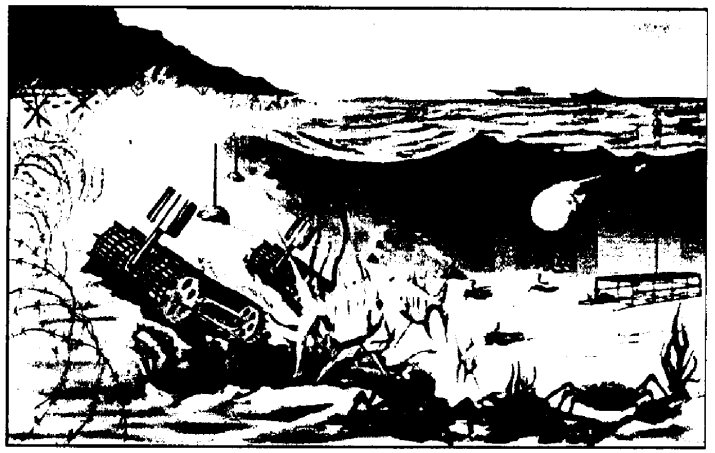
Mine Warfare ...

A Technology Challenge



NDIA Expeditionary Warfare Conference
3 November 1998

MIW S&T Future Directions

- Smaller/Cheaper/Good Enough
  - Increased bandwidth, automatic processing, data fusion
- Multiple remote vehicles and behaviors
  - AUVs, UAVs, UMVs
- Adaptive sensors and systems for optimal performance
  - Environmental adaptability
  - Re-configurable
- Increased focus on reducing "total ownership" cost
  - Early Industry Involvement
- Continued focus on risk mitigation to acquisition

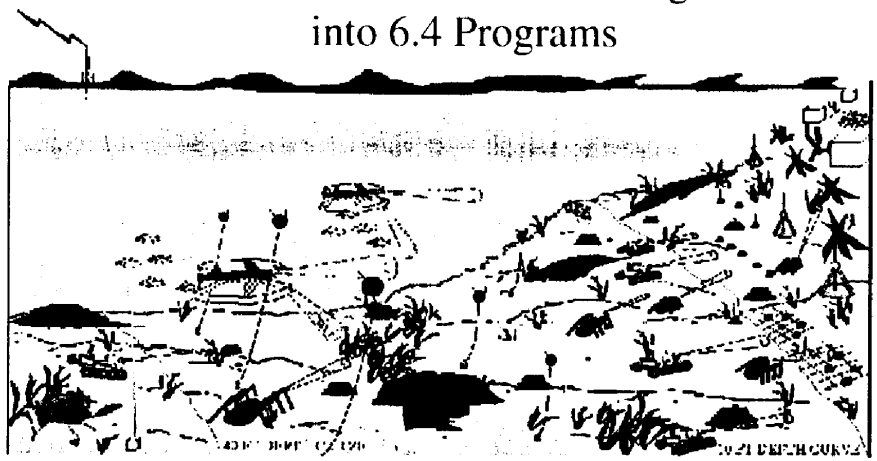
VSW/SZ Reconnaissance

Near Term

Insertion of Combat Swimmer Technologies into 6.4 Programs

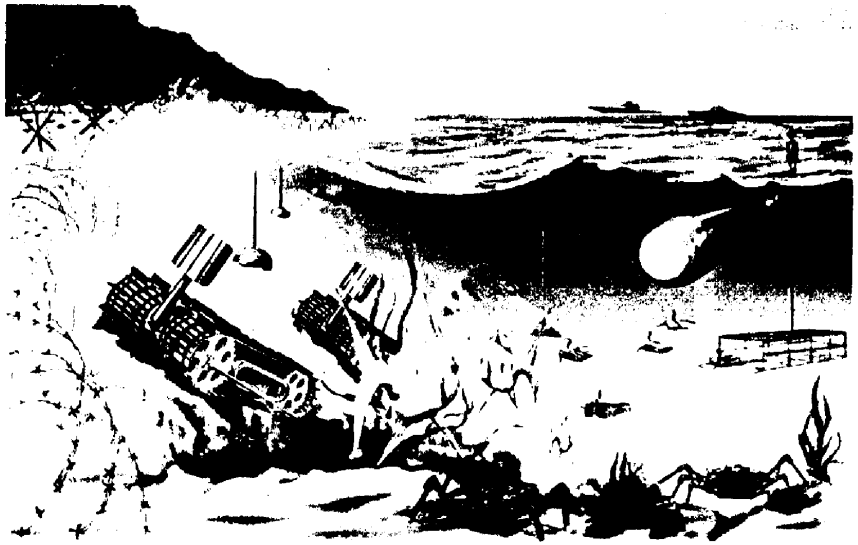
Mid Term

Insertion of UUV Technologies into 6.4 Programs

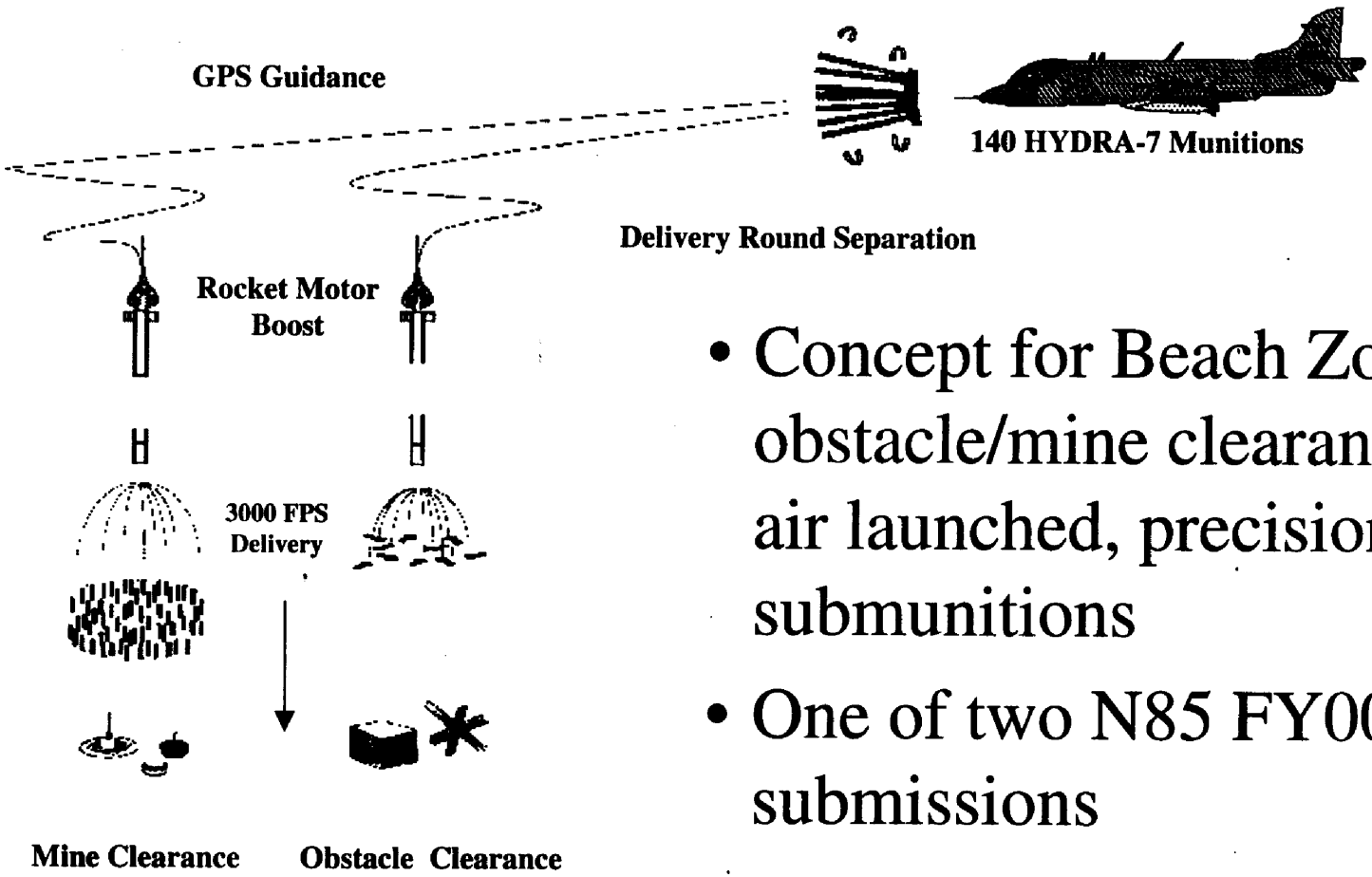


Far Term

Development of "System of Systems" to Remove Divers & Mammals from VSW/SZ Operations



In-Stride Mine/Obstacle Breaching HYDRA-7



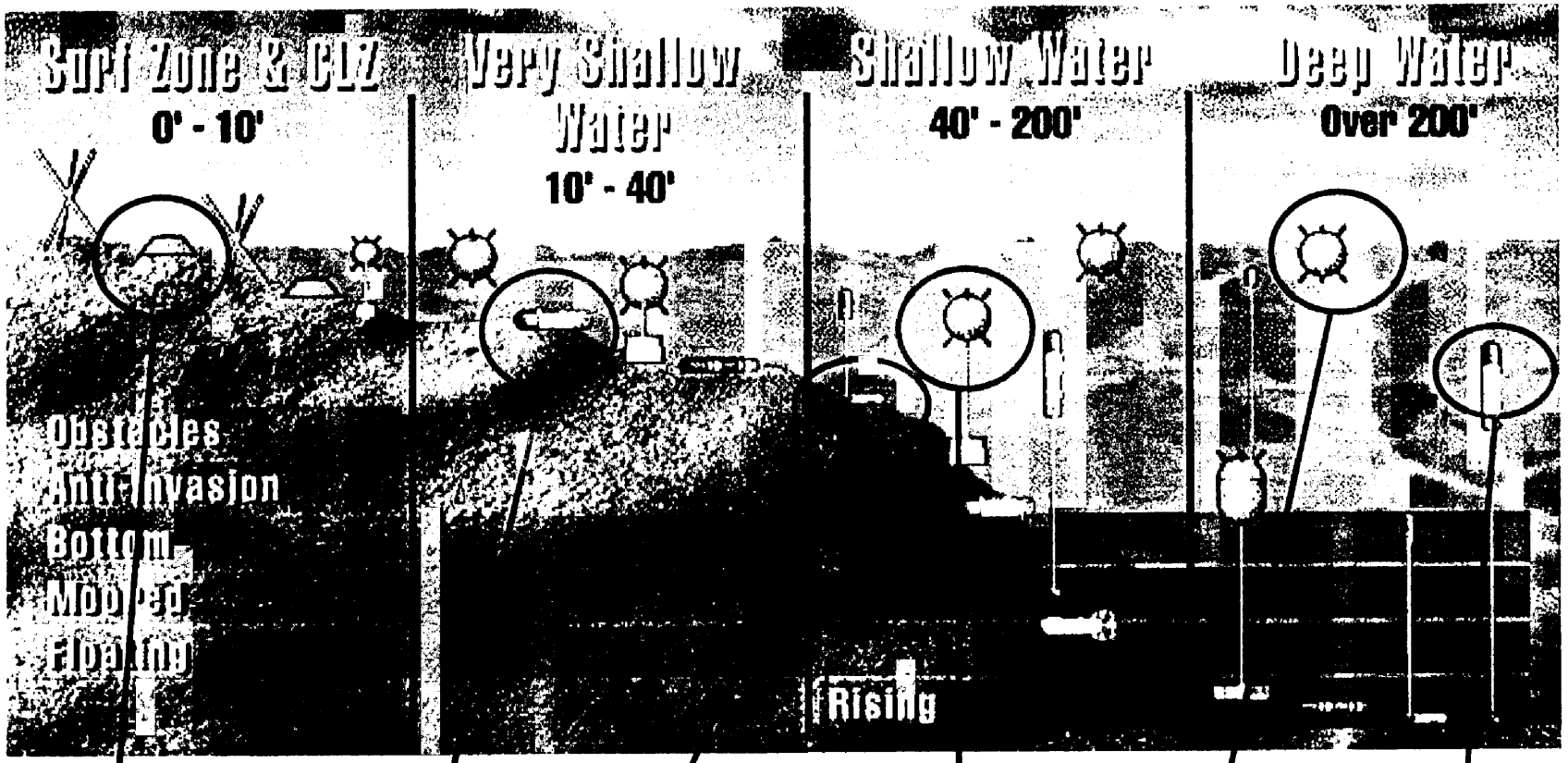
- Concept for Beach Zone obstacle/mine clearance using air launched, precision-guided submunitions
- One of two N85 FY00 ATD submissions

TECHNOLOGY TEAM: *Navy*
Lockheed Martin

Summary

- MIW is a high priority at ONR
- MIW S&T investments fully support Organic Mine Countermeasures
  - Integrated with Acquisition Plan
  - Critical demonstrations to mitigate risk/enhance capabilities
- MIW S&T investments are directed at long term vision
  - Rapidly deployable autonomous systems, in-stride clearance

Complex Environment



Anti-Invasion

Buried/ Partially Buried

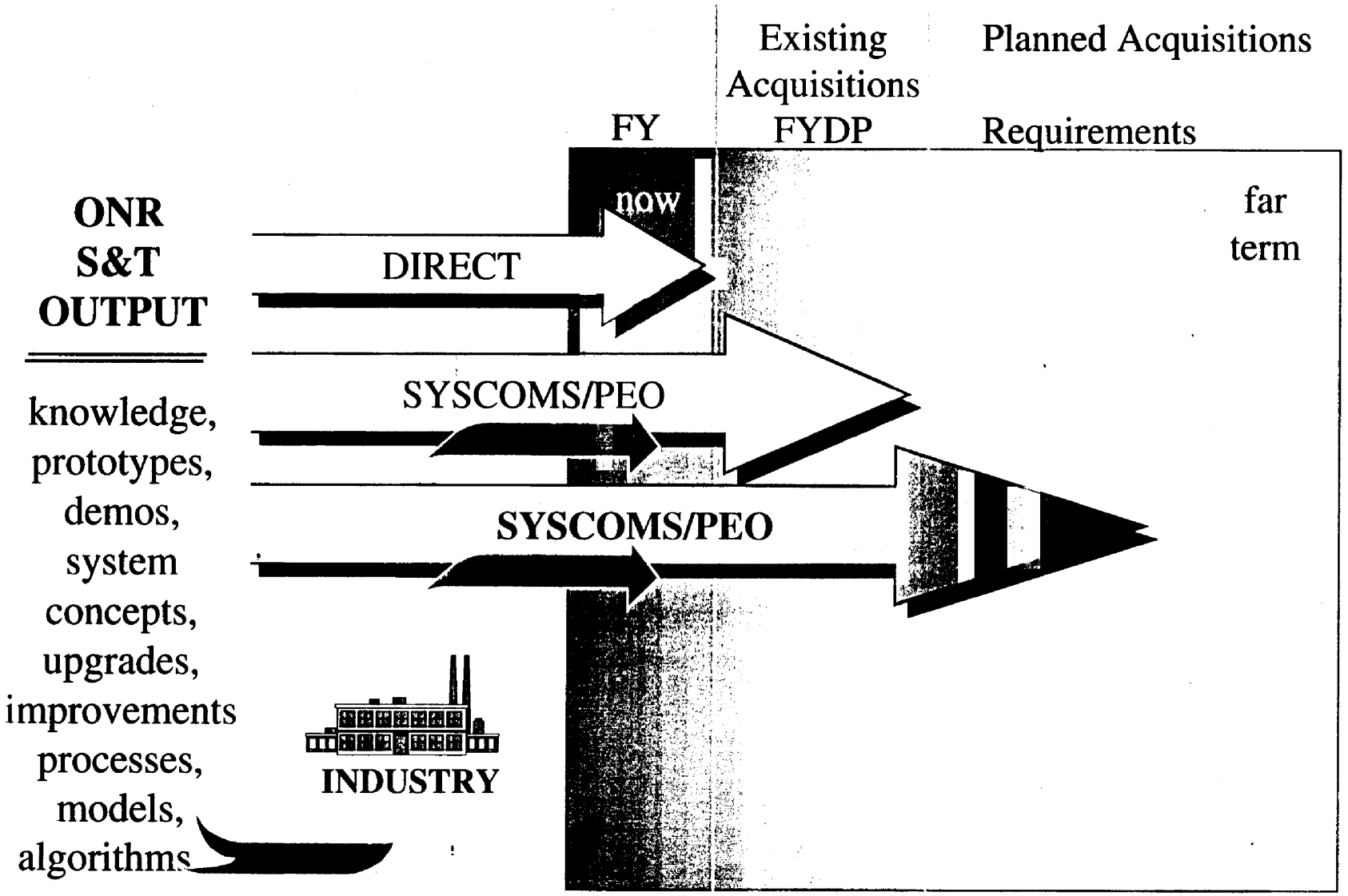
Bottom

Moored

Floating

Rising

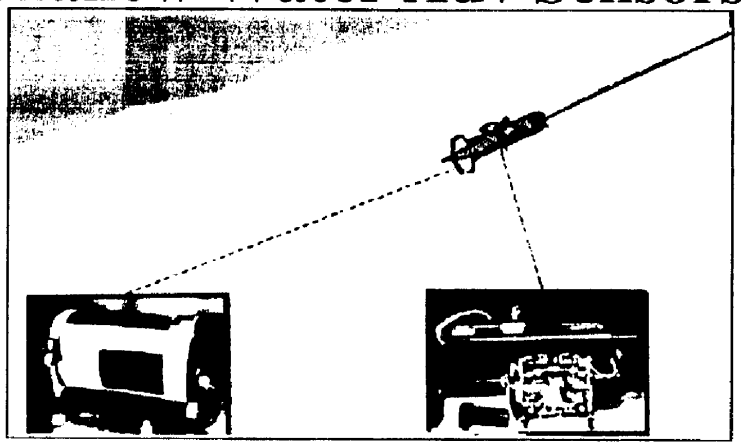
S&T Timeline



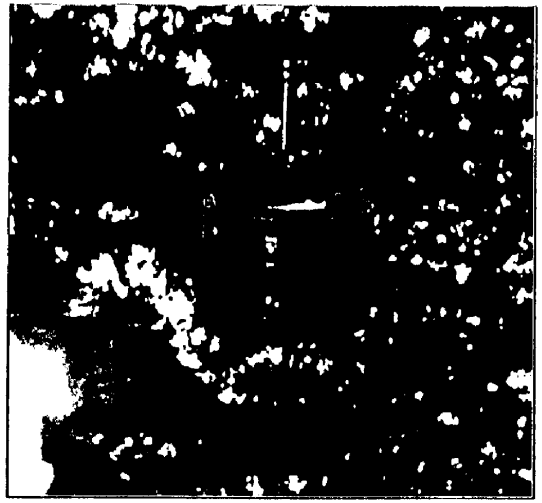
* S&T Has More Than One Customer *

Planned Demonstrations
Kernal Blitz

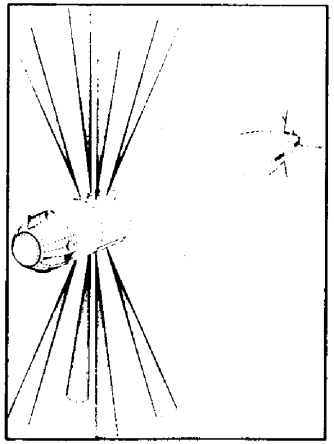
Shallow Water Adv Sensors



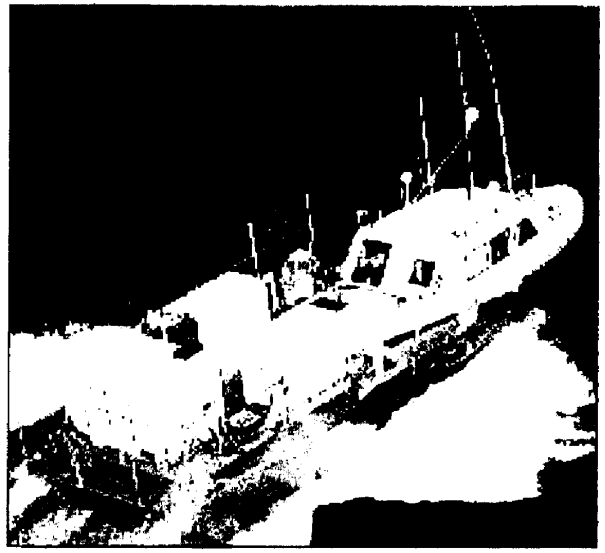
Littoral Remote Sensing



REMUS

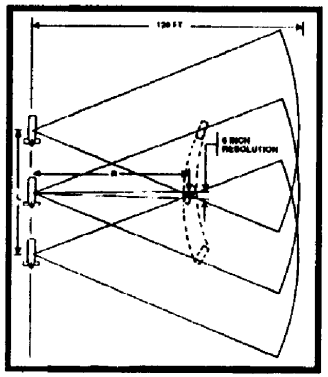


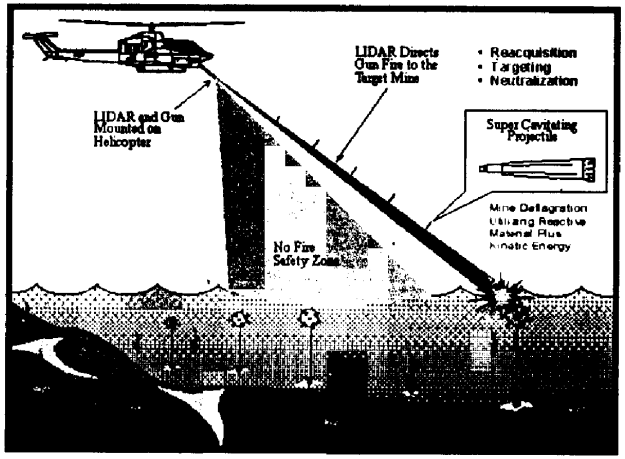
ALISS



Example High Payoff Technologies

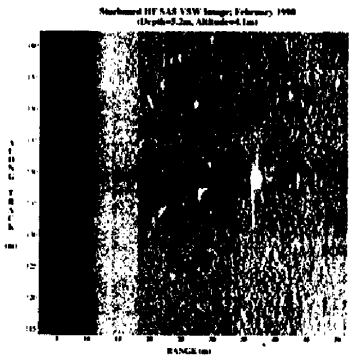
Addressing Affordability and Speed of MCM OPS

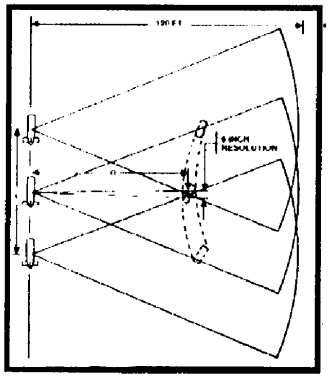




Synthetic Aperture Sonar Technology

- Reduce wet-end size and cost using synthetic aperture technologies
  - Produces high resolution with small physical aperture
  - Size/cost reduction dependent upon operating frequency
    - Potential order of magnitude reduction at low frequencies
- Phase compensation and auto-focusing processing technologies to adapt to environment





TECHNOLOGY TEAM: *Navy*
Northrop-Grumman

Laser Line Scan Development Roadmap

First published ideas regarding synchronized scan imaging (SSI) (A. W. Angelbeck)

Laboratory tests comparing SSI and LIDAR underwater imaging approaches. SSI judged superior.

First Successful laboratory tests of a laser line scan underwater imaging system (LLS)

Monochrome LLS design for MCM (EOID)

First commercial LLS

First EOID sea test

First Fleet EOID system (POM)

EOID P/P model

Commercial LLS plays central role in TWA 800 investigation

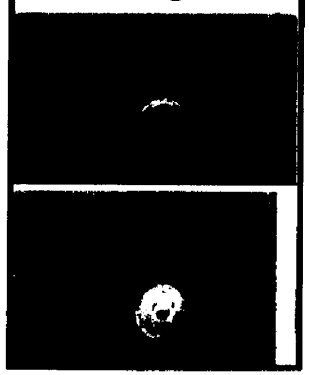
First organic EOID (POM)

Planned First AEOID system in Fleet

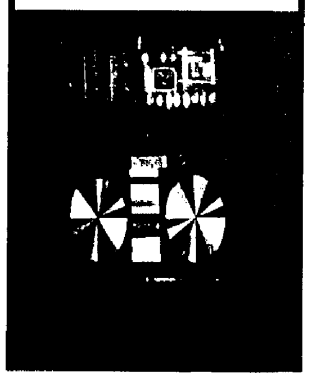
1965 1970 1975 1980 1985 1990 1995 2000 2005 2010

First Successful LLS field test

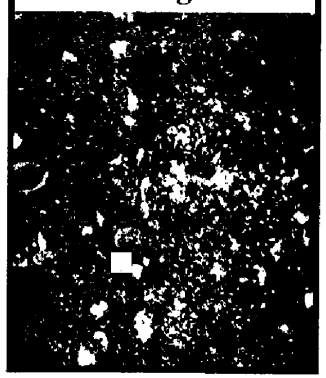
First polarization image



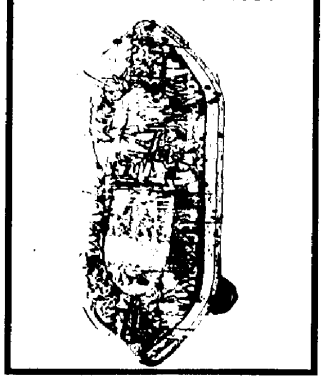
First color image



First fluorescence image



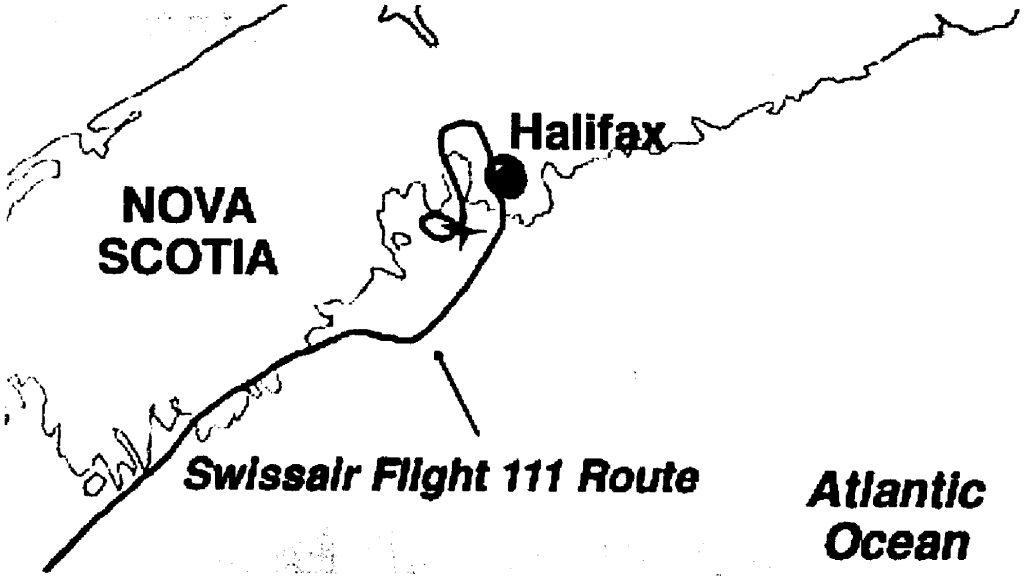
LLS Image of the USS Monitor

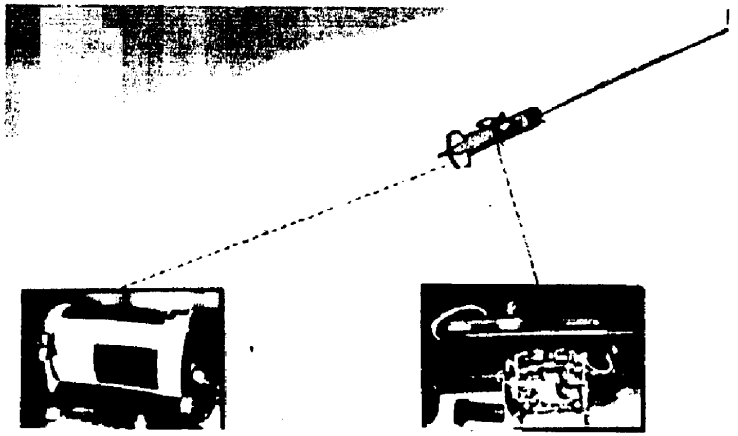


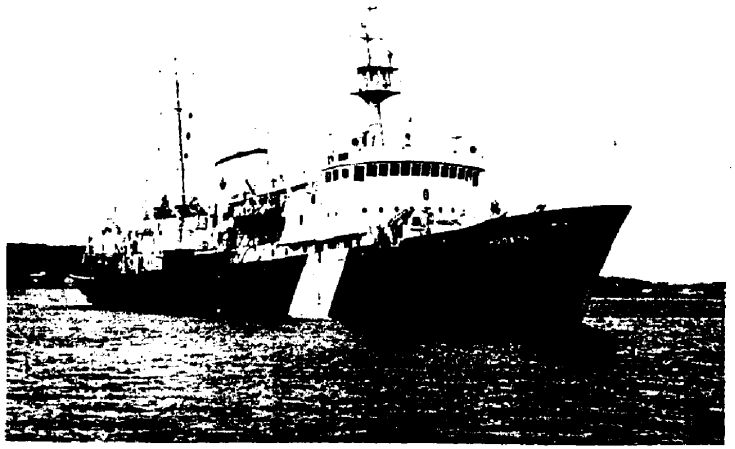
EOID deployed in CJTFEX96

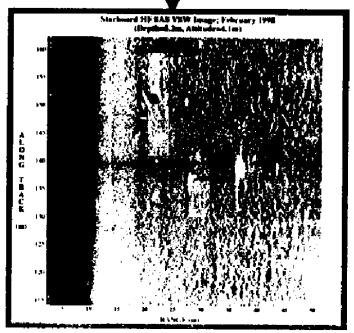
Swissair Crash Site Investigation

Response to Canadian Government Request

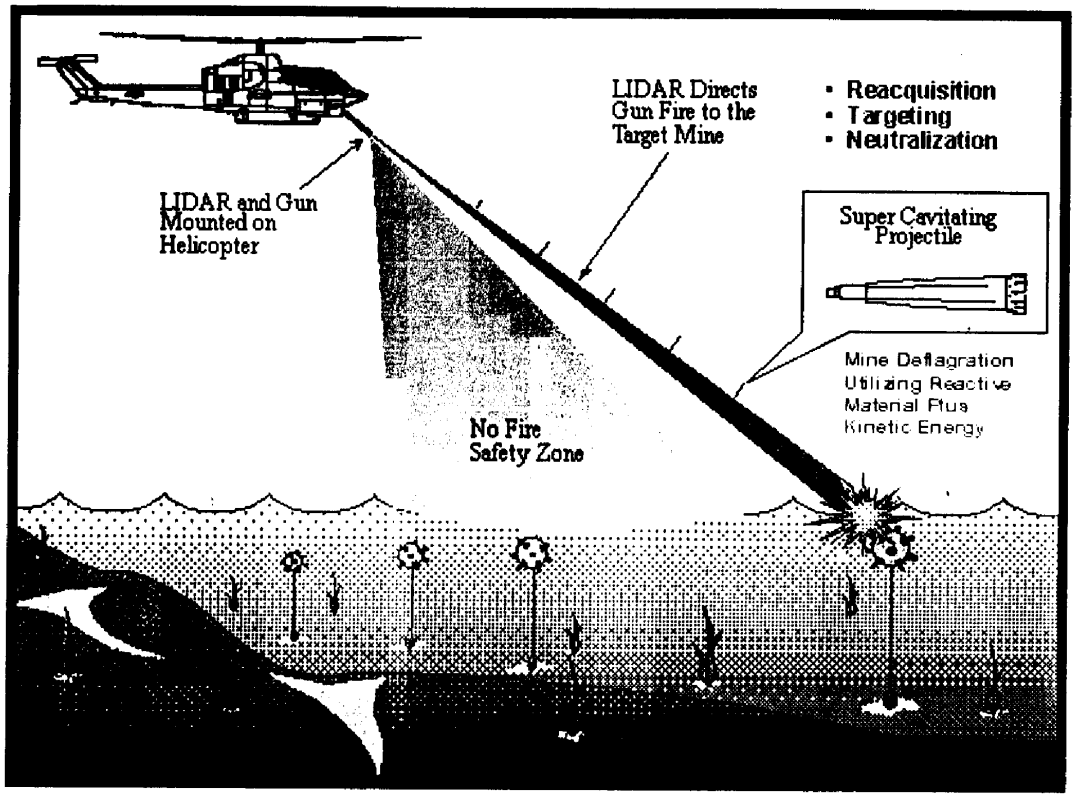








Rapid Area Mine Clearance System (RAMICS) ATD



- ORGANIC CAPABILITY FOR RAPID CLEARANCE OF NEAR SURFACE MOORED CONTACT MINES
- ATD DEMONSTRATES INTEGRATED TARGETING, FIRE CONTROL, GUN SYSTEM, AND PROJECTILE TECHNOLOGIES

TECHNOLOGY TEAM:

Navy
Raytheon
General Dynamics
C-Tech
Kaman